

To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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Not recommended
for new design

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M51955A,B/M51956A,B

Voltage Detecting, System Resetting IC Series

REJ03D0777-0300

Rev.3.00

Sep 18, 2007

Description

M51955A,B/M51956A,B are semiconductor integrated circuits for resetting of all types of logic circuits such as CPUs, and has the feature of setting the detection voltage by adding external resistance.

They include a built-in delay circuit to provide a retardation time (200 μ s Typ).

They find extensive applications, including battery checking circuit, level detecting circuit and waveform shaping circuit.

Features

- Few external parts
- Low threshold operating voltage (Supply voltage to keep low-state at low supply voltage): 0.6 V (Typ) at $R_L = 22 \text{ k}\Omega$
- Wide supply voltage range: 2 V to 17 V
- Wide application range

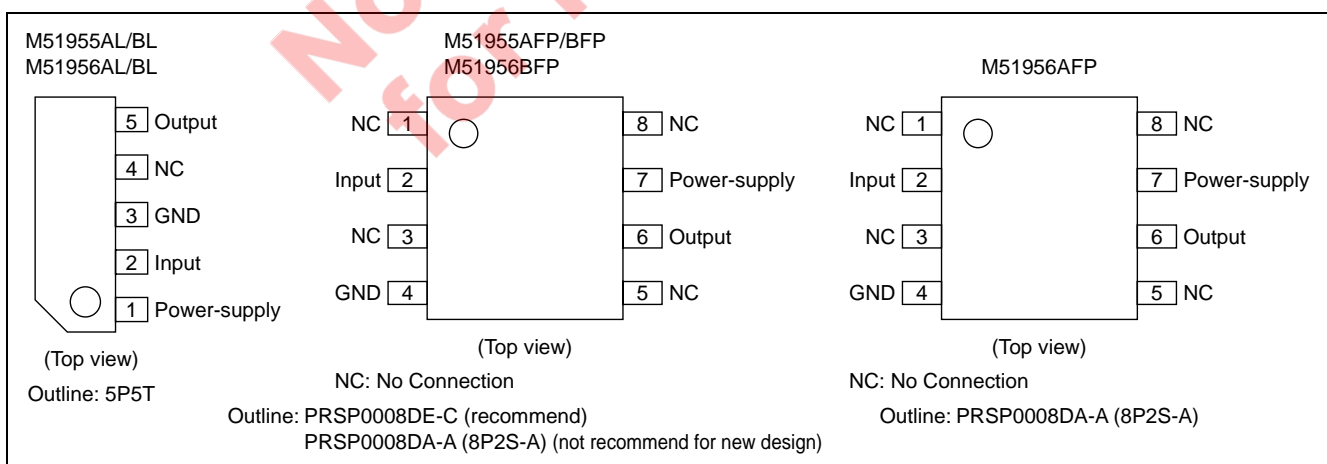
Application

- Reset circuit of Pch, Nch, CMOS, microcomputer, CPU and MCU, Reset of logic circuit, Battery check circuit, switching circuit back-up voltage, level detecting circuit, waveform shaping circuit, delay waveform generating circuit, DC/DC converter, over voltage protection circuit

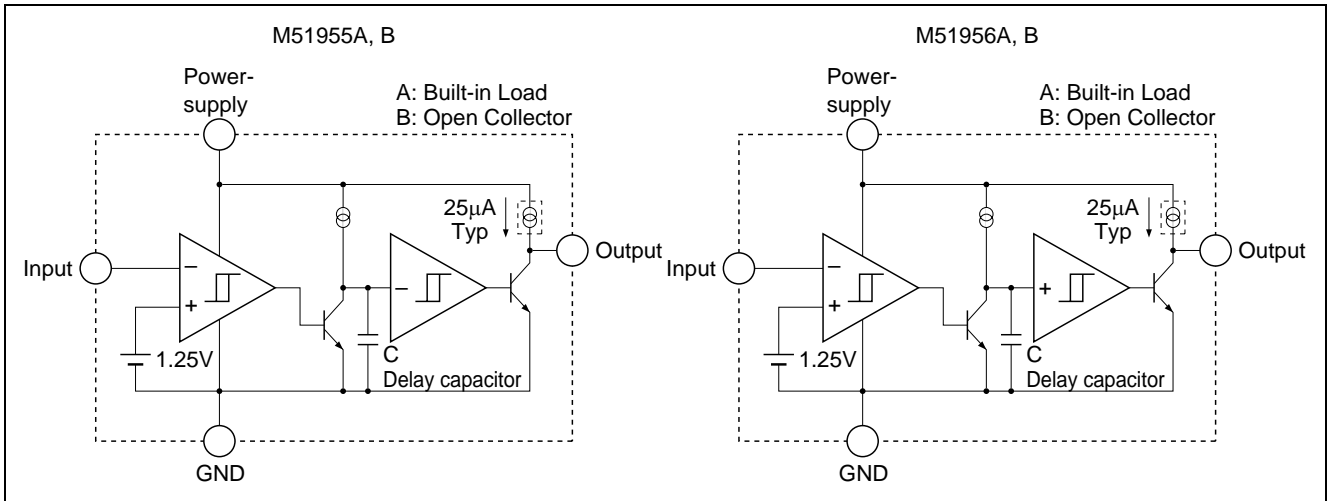
Recommended Operating Condition

- Supply voltage range: 2 V to 17 V

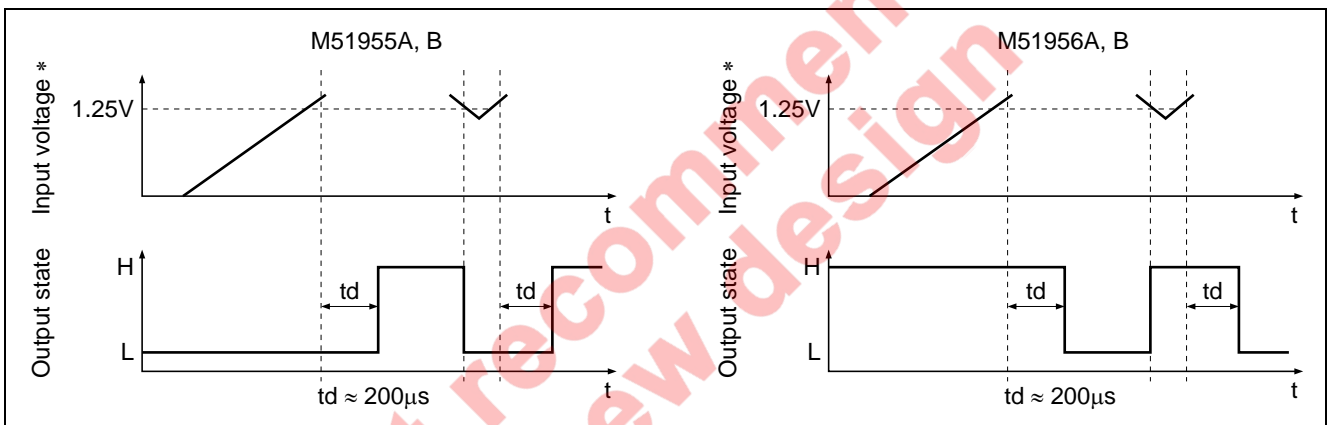
Pin Arrangement



Block Diagram



Operating Waveform



Absolute Maximum Ratings

(Ta = 25°C, unless otherwise noted)

| Item | Symbol | Ratings | Unit | Conditions | |
|-----------------------|-------------------|-------------------------|-------|--|---|
| Supply voltage | V _{CC} | 18 | V | | |
| Output sink current | I _{sink} | 6 | mA | | |
| Output voltage | V _O | V _{CC} | V | Type A (output with constant current load) | |
| | | 18 | | Type B (open collector output) | |
| Power dissipation | P _d | 450 | mW | 5-pin SIP | |
| | | 400 | | 8-pin SOP (PRSP0008DE-C): recommend | |
| | | 300 | | 8-pin SOP (PRSP0008DA-A): not recommend | |
| Thermal derating | K _θ | 4.5 | mW/°C | Refer to the thermal derating curve. | 5-pin SIP |
| | | 4.4 | | | 8-pin SOP (PRSP0008DE-C): recommend |
| | | 3 | | | 8-pin SOP (PRSP0008DA-A): not recommend |
| Operating temperature | T _{opr} | -30 to +85 | °C | | |
| Storage temperature | T _{stg} | -40 to +125 | °C | | |
| Input voltage range | V _{IN} | -0.3 to V _{CC} | V | V _{CC} ≤ 7 V | |
| | | -0.3 to +7 | | V _{CC} > 7 V | |

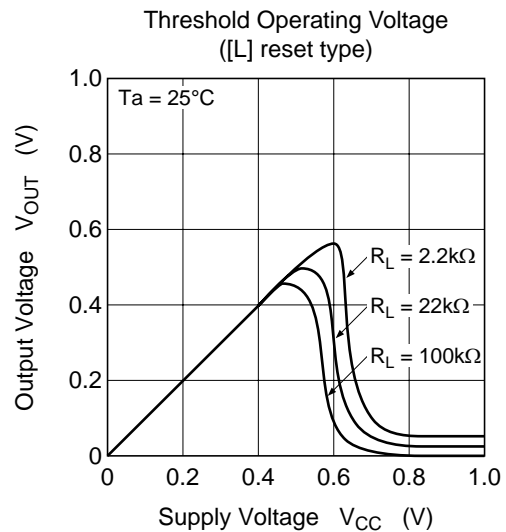
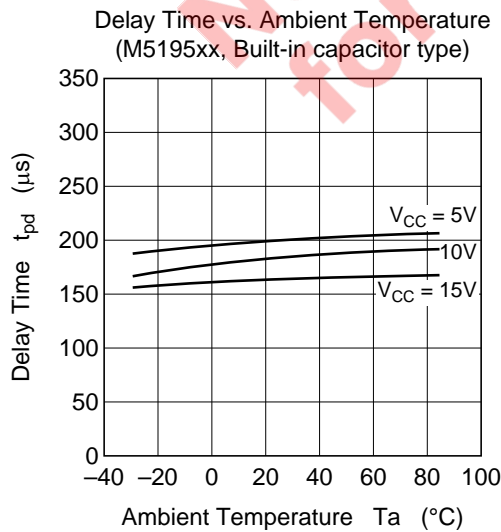
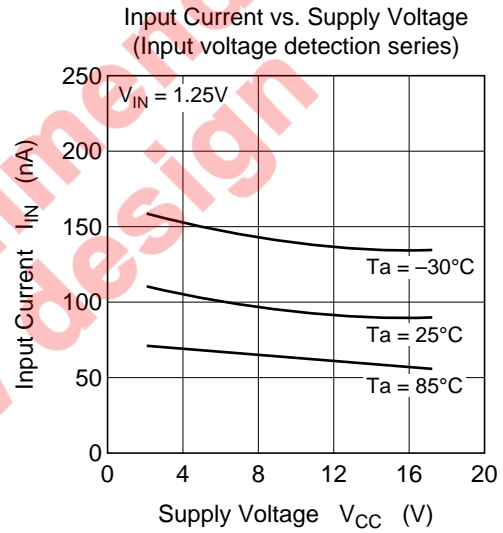
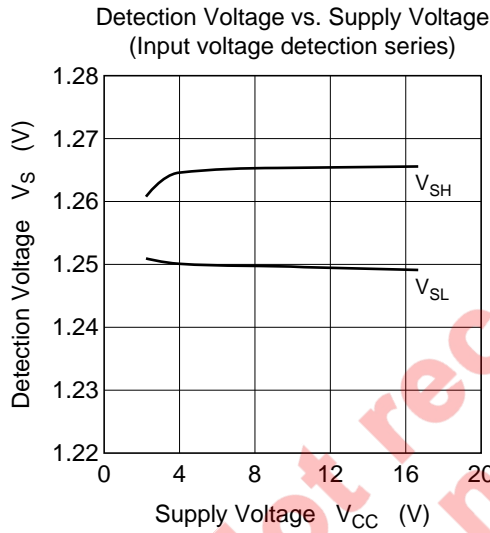
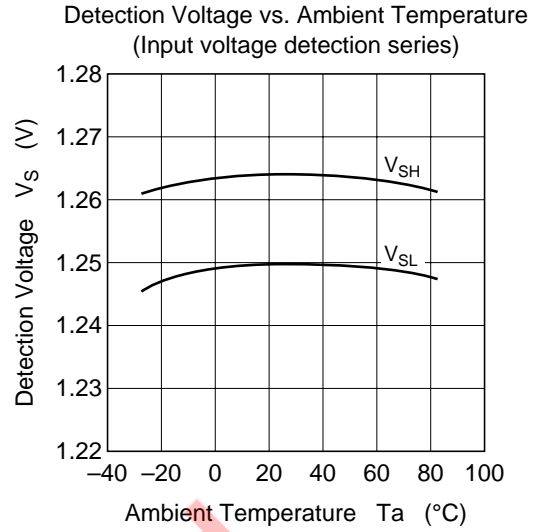
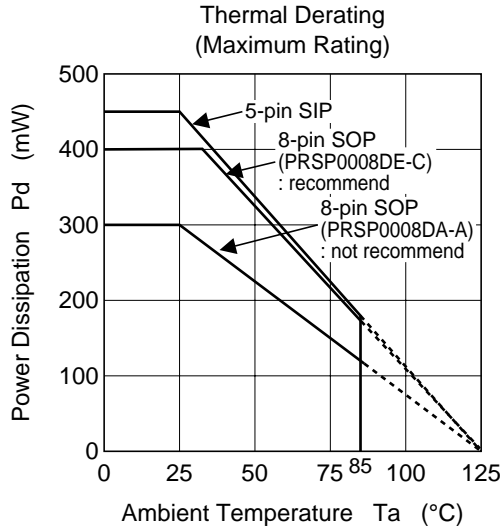
Electrical Characteristics

(Ta = 25°C, unless otherwise noted)

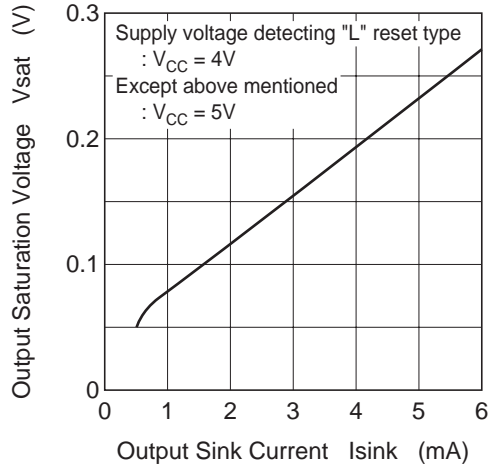
- “L” reset type M51955A, M51955B
- “H” reset type M51956A, M51956B

| Item | Symbol | Min | Typ | Max | Unit | Test Conditions | |
|---|--------------------|----------------------|-----------------------|-----------------|------|--|---|
| Detecting voltage | V _s | 1.20 | 1.25 | 1.30 | V | | |
| Hysteresis voltage | ΔV _s | 9 | 15 | 23 | mV | V _{CC} = 5V | |
| Detecting voltage temperature coefficient | V _s /ΔT | — | 0.01 | — | %/°C | | |
| Supply voltage range | V _{CC} | 2 | — | 17 | V | | |
| Input voltage range | V _{IN} | -0.3 | — | V _{CC} | V | V _{CC} ≤ 7V | |
| | | -0.3 | — | 7 | | V _{CC} > 7V | |
| Input current | I _{IN} | — | 100 | 500 | nA | V _{IN} = 1.25V | |
| Circuit current | I _{CC} | — | 390 | 590 | μA | Type A, V _{CC} = 5V | |
| | | — | 360 | 540 | | Type B, V _{CC} = 5V | |
| Delay time | t _{pd} | 80 | 200 | 500 | μs | | |
| Output saturation voltage | V _{sat} | — | 0.2 | 0.4 | V | L reset type, V _{CC} = 5V, V _{IN} < 1.2V, I _{sink} = 4mA | |
| | | — | 0.2 | 0.4 | | H reset type, V _{CC} = 5V, V _{IN} > 1.35V, I _{sink} = 4mA | |
| Threshold operating voltage | V _{OPL} | — | 0.67 | 0.8 | V | L reset type minimum supply voltage for IC operation | R _L = 2.2kΩ, V _{sat} ≤ 0.4V |
| | | — | 0.55 | 0.7 | | | R _L = 100kΩ, V _{sat} ≤ 0.4V |
| Output leakage current | I _{OH} | — | — | 30 | nA | Type B | |
| Output load current | I _{OC} | -40 | -25 | -17 | μA | Type A, V _{CC} = 5V, V _O = 1/2 × V _{CC} | |
| Output high voltage | V _{OH} | V _{CC} -0.2 | V _{CC} -0.06 | — | V | Type A | |

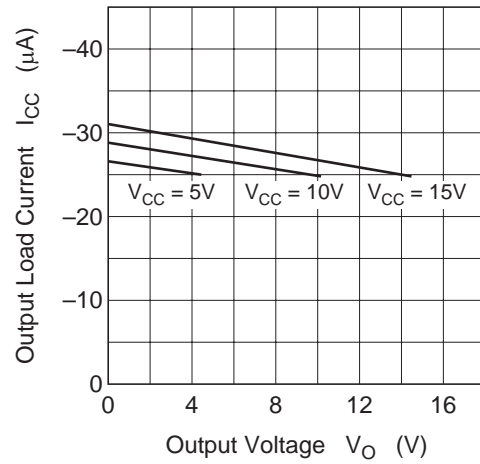
Typical Characteristics



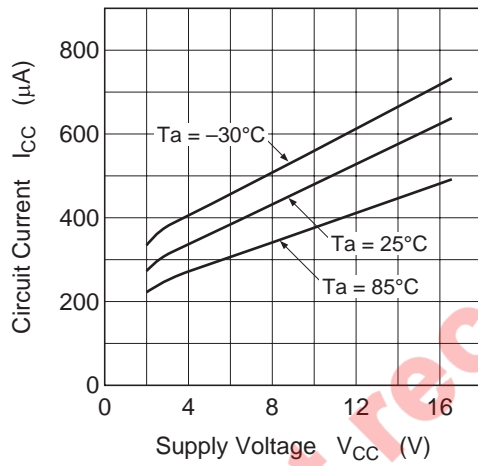
Output Saturation Voltage vs. Output Sink Current



Output Load Current vs. Output Voltage (M5195xA)



Circuit Current vs. Supply Voltage (M51955B, M51956B)



Not recommended for new design

Example of Application Circuit

Reset Circuit of M5195xx Series

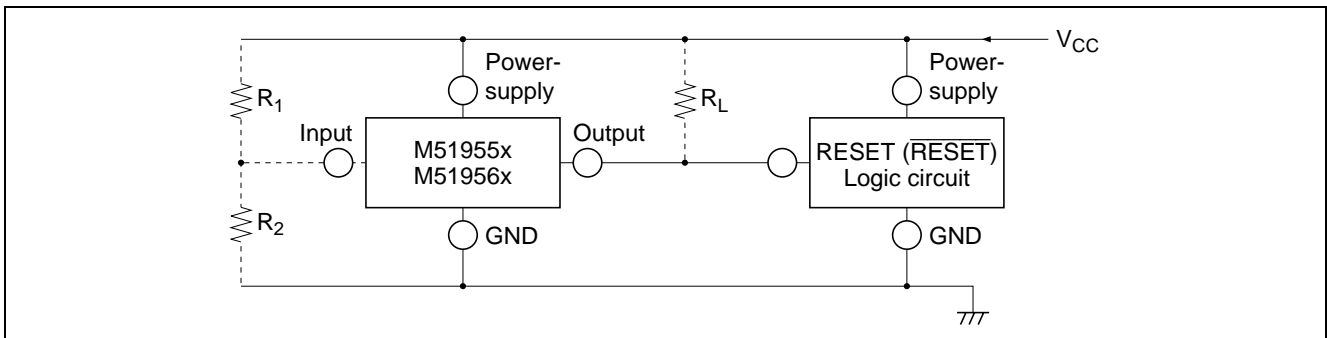


Figure 1 Reset Circuit of M5195xx Series

- Notes:
1. When the detecting supply voltage is 4.25 V, M51951, M51952, M51953 and M51954 are used. In this case, R_1 and R_2 are not necessary.
When the voltage is anything except 4.25 V, M51955, M51956, M51957 and M51958 are used. In this case, the detecting supply voltage is $1.25 \times (R_1 + R_2)/R_2$ (V) approximately. The detecting supply voltage can be set between 2 V and 15 V.
 2. When the delay time is short, M51951, M51952, M51955 and M51956 are available. These ICs have a delay capacity and the delay time is about 200 μ s.
If a longer delay time is necessary, M51953, M51954, M51957 and M51958 are used. In this case, the delay time is about $0.34 \times C_d$ (pF) μ s.
 3. If the M5195xx and the logic circuit share a common power source, type A (built-in load type) can be used whether a pull-up resistor is included in the logic circuit or not.
 4. The logic circuit preferably should not have a pull-down resistor, but if one is present, add load resistor R_L to overcome the pull-down resistor.
 5. When the reset terminal in the logic circuit is of the low reset type, M51951, M51953, M51955 and M51957 are used and when the terminal is of the high reset type, M51952, M51954, M51956 and M51958 are used.
 6. When a negative supply voltage is used, the supply voltage side of M5195xx and the GND side are connected to negative supply voltage respectively.

Notice for use

About the Power Supply Line

1. About bypass capacitor

Because the ripple and the spike of the high frequency noise and the low frequency are superimposed to the power supply line, it is necessary to remove these.

Therefore, please install C_1 and C_2 for the low frequency and for the high frequency between the power supply line and the GND line as shown in following figure 2.

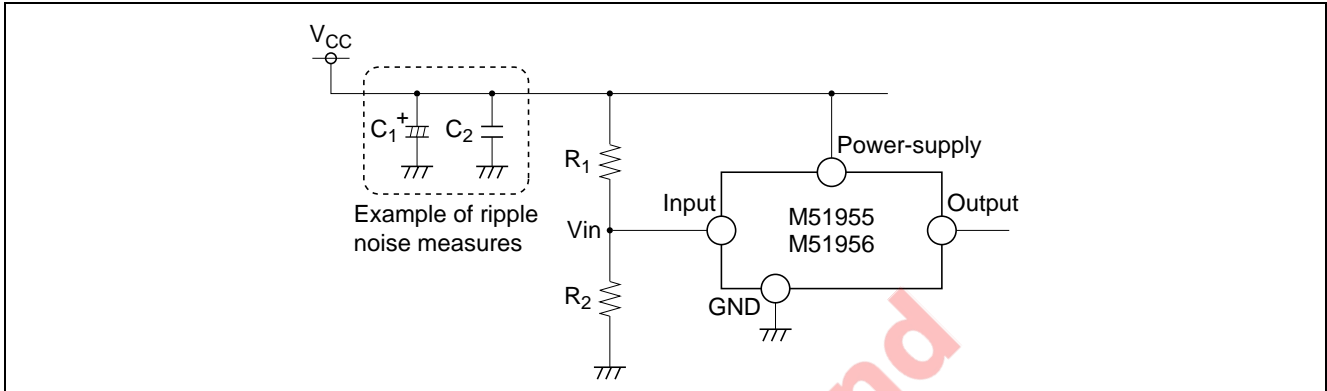


Figure 2 Example of Ripple Noise Measures

2. The sequence of voltage impression

Please do not impress the voltages to the input terminals earlier than the power supply terminal. Moreover, please do not open the power supply terminal with the voltage impressed to the input terminal.

(The setting of the bias of an internal circuit collapses, and a parasitic element might operate.)

About the Input Terminal

1. Setting range of input voltage

The following voltage is recommended to be input to the input terminal (pin 2).

about $0.8 \text{ (V)} < V_{in} < V_{CC} - 0.3 \text{ (V)}$ at $V_{CC} \leq 7 \text{ V}$

about $0.8 \text{ (V)} < V_{in} < 6.7 \text{ (V)}$ at $V_{CC} > 7 \text{ V}$

2. About using input terminal

Please do an enough verification to the transition characteristic etc. of the power supply when using independent power supply to input terminal (pin 2).

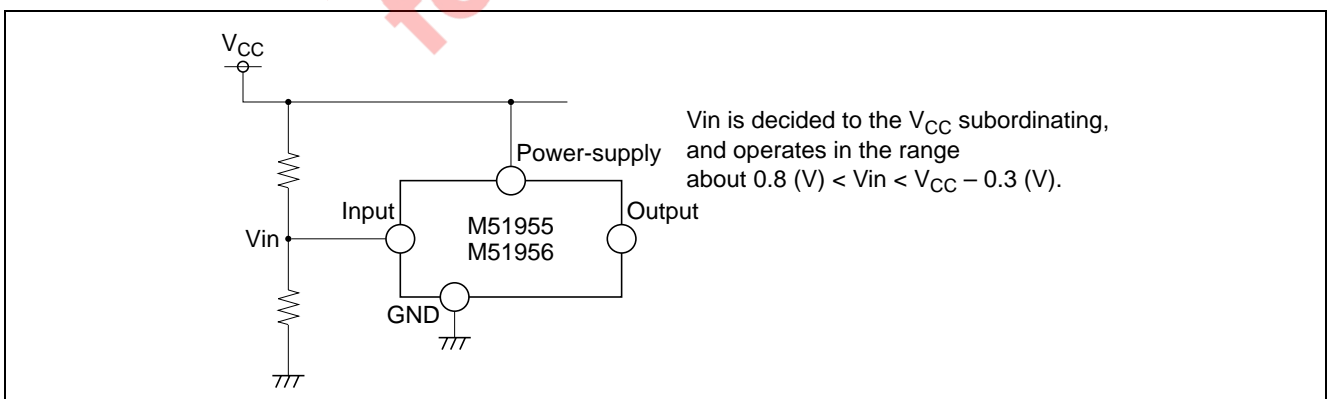


Figure 3 Recommended Example

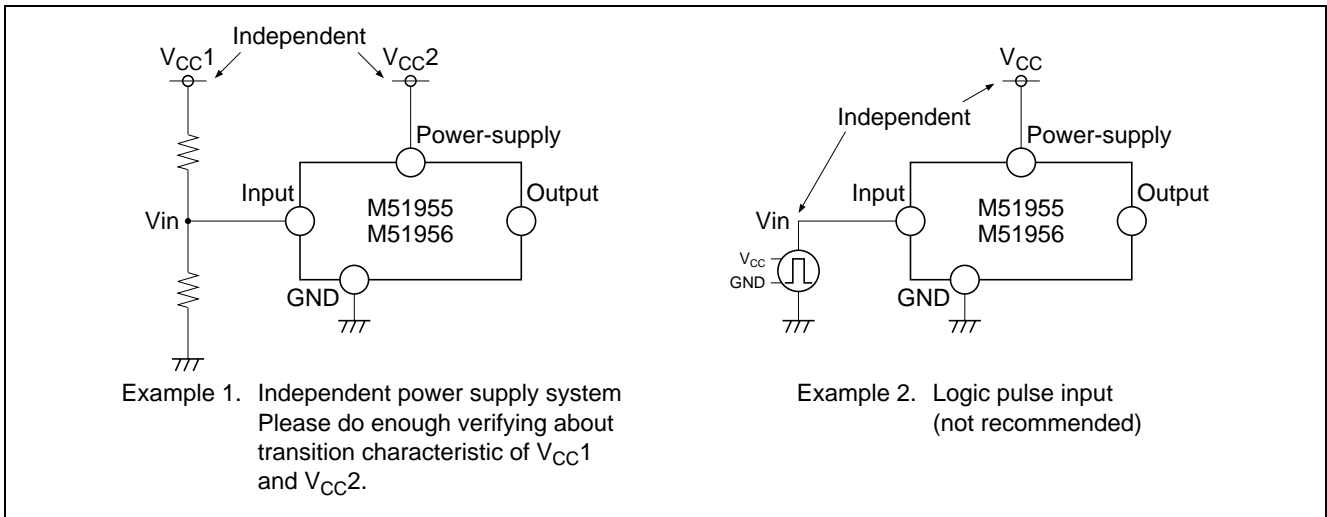


Figure 4

3. Calculation of detecting voltage

Detecting voltage V_S can be calculated by the following expression.

However, the error margin is caused in the detecting voltage because input current I_{in} (standard 100 nA) exists if it sets too big resistance.

Please set the constant to disregard this error margin.

$$V_S = 1.25 \times \left(\frac{R_1 + R_2}{R_2} \right) + \frac{I_{in} \times R_1}{\text{error margin}}$$

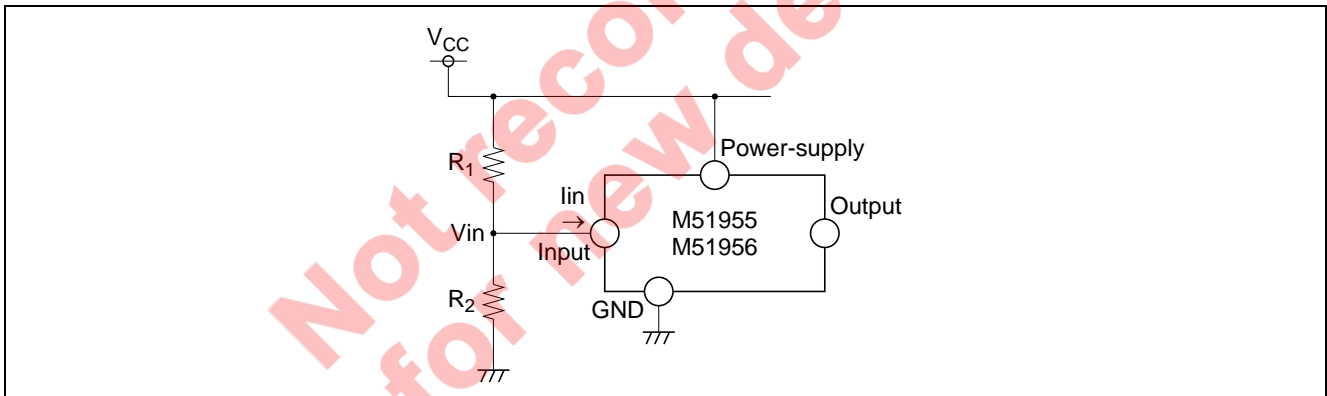


Figure 5 Influence of Input Current

4. About the voltage input outside ratings

Please do not input the voltage outside ratings to the input terminal.

An internal protection diode becomes order bias, and a large current flows.

Setting of Output Load Resistance (M51955B/M51956B)

High level output voltage can be set without depending on the power-supply voltage because the output terminal is an open collector type. However, please guard the following notes.

1. Please set it in value (2 V to 17 V) within the range of the power-supply voltage recommendation. Moreover, please never impress the voltage of maximum ratings 18 V or more even momentarily either.
2. Please set output load resistance (pull-up resistance) R_L so that the output current (output inflow current I_L) at L level may become 4 mA or less. Moreover, please never exceed absolute maximum rating (6 mA).

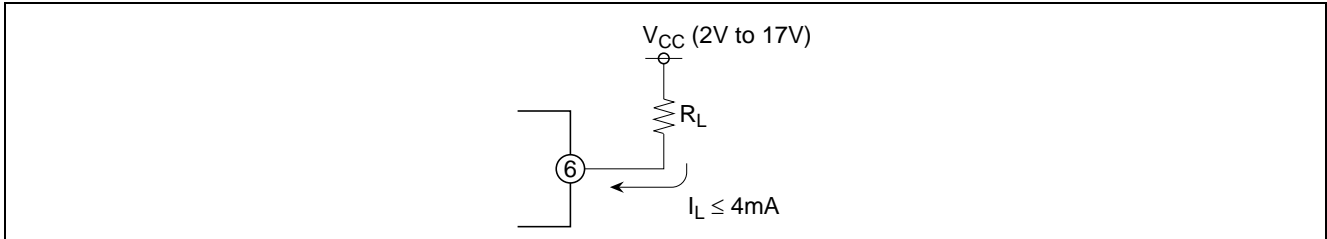


Figure 6 Output Load Resistance R_L

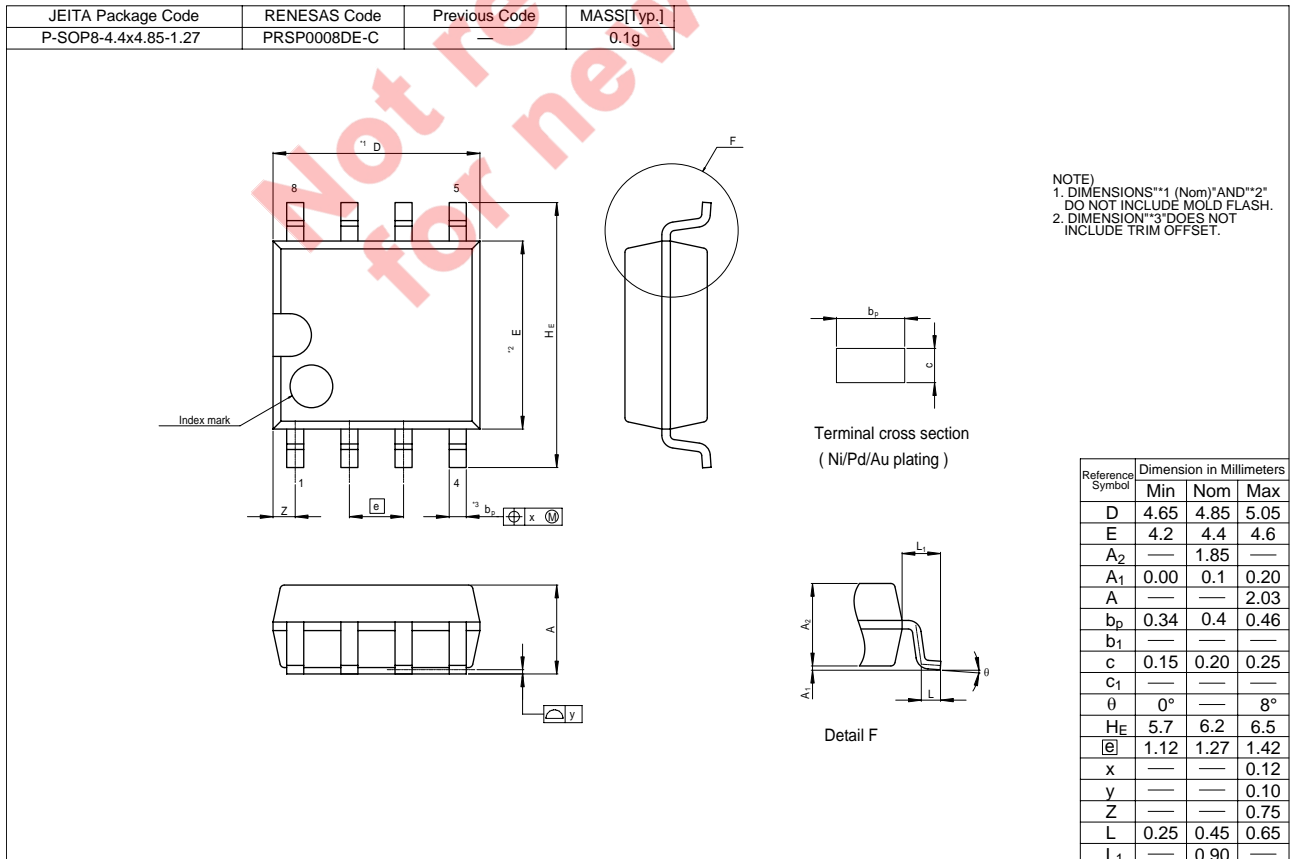
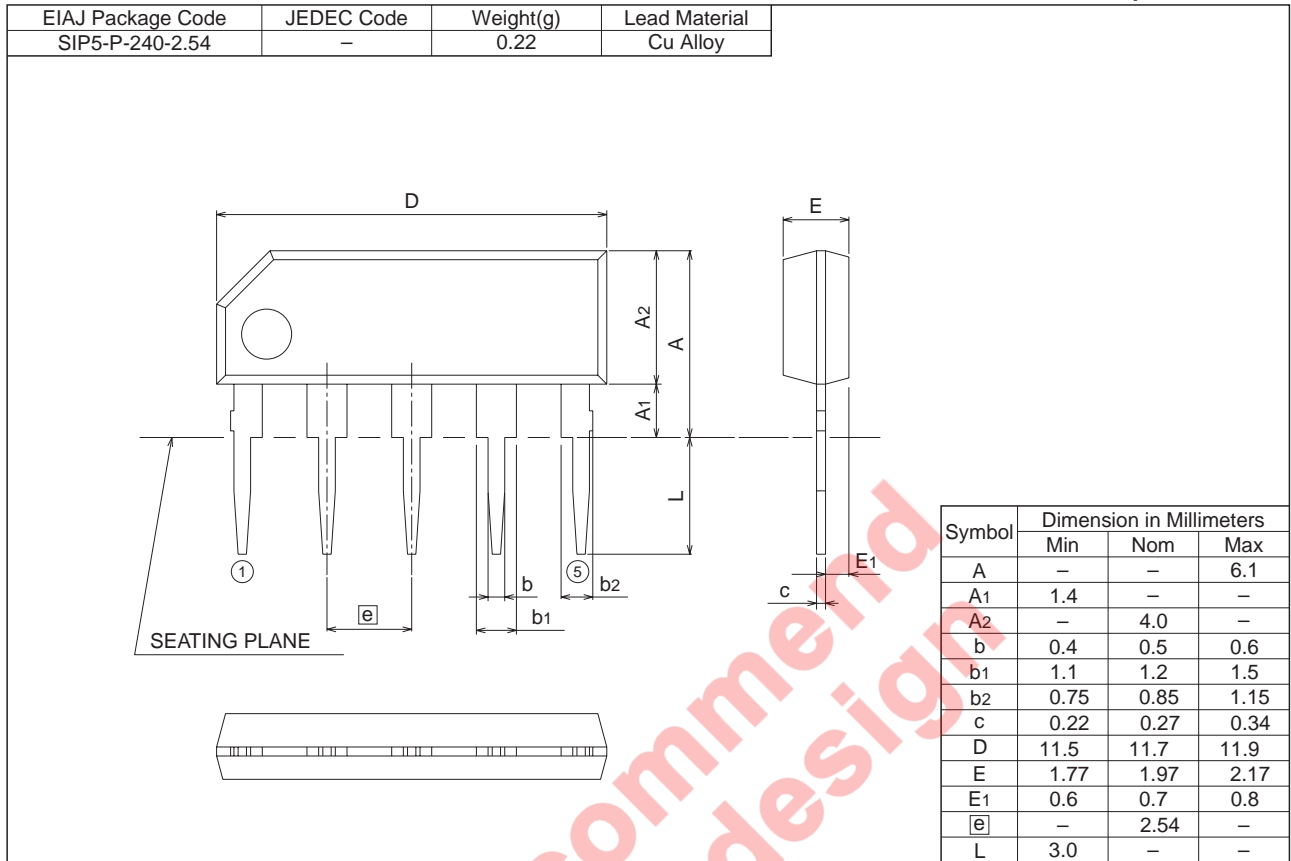
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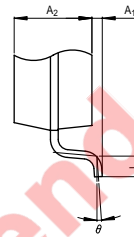
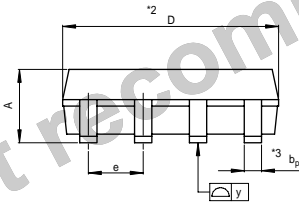
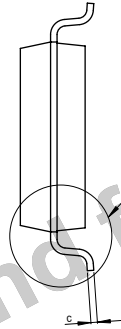
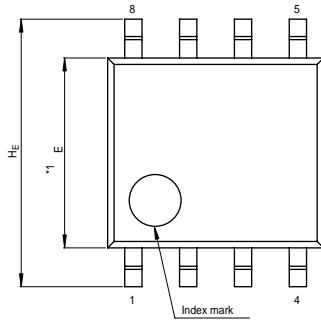
5P5T

Plastic 5pin 240mil SIP



M51955A,B/M51956A,B

| | | | |
|--------------------|--------------|---------------|------------|
| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
| P-SOP8-4.4x5-1.27 | PRSP0008DA-A | 8P2S-A | 0.07g |



NOTE)
 1. DIMENSIONS **1* AND **2* DO NOT INCLUDE MOLD FLASH.
 2. DIMENSION **3* DOES NOT INCLUDE TRIM OFFSET.

| Reference Symbol | Dimension in Millimeters | | |
|------------------|--------------------------|------|------|
| | Min | Nom | Max |
| D | 4.8 | 5.0 | 5.2 |
| E | 4.2 | 4.4 | 4.6 |
| A ₂ | — | 1.5 | — |
| A ₁ | 0.05 | — | — |
| A | — | — | 1.9 |
| b _p | 0.35 | 0.4 | 0.5 |
| c | 0.13 | 0.15 | 0.2 |
| θ | 0° | — | 10° |
| H _E | 5.9 | 6.2 | 6.5 |
| e | 1.12 | 1.27 | 1.42 |
| y | — | — | 0.1 |
| L | 0.2 | 0.4 | 0.6 |

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